

REMARKS

In the January 25, 2007 Office Action, claims 38-55 were rejected. This Response does not amend claims. Claims 38-55 (18 total claims; 2 independent claims) remain pending in the application. Reconsideration of the application is respectfully requested in view of the following remarks.

DISCUSSION

1. Terminology

It is well known that an applicant for patent may be “his own lexicographer” and has considerable leeway in defining terms except that the definitions may not conflict with the ordinary meaning attributed to a commonly used term of art. For example, a “flange” is the name of an object commonly used in the mechanical arts and one may not (re)define a “flange” to mean a type of fastener. Similarly, the meaning of the term “polymer” is reasonably well understood in the chemical arts so that one of skill in the art reasonably knows a polymer to include a plurality of monomers covalently bonded together, for example. A monomer is of course not a polymer, but a polymer precursor. Therefore, for example, if an inventor chooses to specify that not only polymers, but also polymer precursors, may be useful in his claimed process, he must coin a new term to encompass both. Hence the use of the term “polymerization material” in Ryang. Applicant respectfully notes that the Office Action’s assertion that Ryang uses the term “polymer material” is not correct. Ryang does not use this specific term. Ryang defines his term “polymerization material” as “any material capable of forming a pre-polymer material, a partially polymerized material, or a polymer.”

The polymerization material is any material capable of forming a pre-polymer material, a partially polymerized material or a polymer. The polymerization material may be monomers, a B-staged polymer, or a polymer. In one embodiment, the polymerization material is at least one of an acrylic resin, an unsaturated polyester resin, a saturated polyester resin, an alkyl resin, a vinyl ester resin, a polyurethane resin, an epoxy resin, a phenol resin, an urea-aldehyde resin, a polyvinyl aromatic, a maleimide resin, a polyvinyl halide resin, a polyolefin, a polyorganosiloxane, an amino resin, a polyamide, a polyimide, a polyesterimide, a polyphenylene sulfide resin, an aromatic polysulfone, a polyamideimide, a polyesterimide, a polyesteramideimide, a polyvinyl acetal, a fluorinated polymer, a polycarbonate and the like.

The Ryang definition covers monomers, B-staged polymers and polymers. The definition of the term “polymer material” in the present application likewise includes a wide range of materials. Specifically, the application states:

[0011] As used herein, the term “polymer material” of the various embodiments of the present invention may comprise any conventional polymer or polymer precursor. The polymer material may be any material that comprises or is capable of forming a pre-polymer material, a partially polymerized material or a polymer. The polymer material may be monomers, a B-staged polymer, or a polymer. In one exemplary embodiment of the present invention, the polymer material may be a curable resin, including a light or UV curable resin, such as acrylics, methacrylates, and unsaturated polyesters. In another exemplary embodiment of the present invention, the polymer material is at least one thermosetting resin that can be cured by means of external energy such as heat, light or electron beam to form at least a partially three dimensional cured product. In another embodiment, the polymer material is at least one thermoplastic resin that can be solidified after transformation into a liquid or partially liquid state. In yet another embodiment, the polymer material is a mixture containing at least one thermoplastic resin and at least one thermosetting resin.

Applicant’s definition of the term “polymer material” includes at least polymers, monomers and B-staged polymers.

2. The Ryang Prior Art

The Office Action’s primary reference for claim rejection is Ryang. Accordingly, once Ryang is distinguished from the subject matter of the amended claims, the bases for rejection must be withdrawn.

Ryang sets forth three process sequences in the Summary of the Invention section that specify at what stage the polymerization material is contacted with the other component. Ryang states as follows:

40 In one embodiment, the present invention relates to a polymer prepared from a mixture containing a polymerization material and a polycondensation product of a partially hydrolyzed chelated metal oxide precursor.

45 In another embodiment, the present invention relates to a process for making a polymer involving contacting a polymerization material with a metal oxide sol comprising a liquid and a polycondensation product of a partially hydrolyzed chelated metal oxide precursor to form a mixture and at least one of polymerizing, curing, heating and cooling the mixture of the polymerization material and the polycondensation product.

50 In yet another embodiment, the present invention relates to a prepolymer mixture containing a polymerization material and a metal oxide sol comprising a liquid and a polycondensation product of a partially hydrolyzed chelated metal oxide precursor.

55 The metal oxide sols are not particulate fillers which are added to polymers and physically trapped by the polymer network whereby the fillers are readily extractable in the resultant polymer system. Instead, the polycondensed partially hydrolyzed chelated metal oxide precursors are chemically incorporated into the polymer network on a molecular level. It is believed that open functionalities (reactable functional group of the multifunctional compound) of the metal

oxide sol react with the polymer during polymerization, curing, heating, and/or cooling thereby uniformly dispersing itself on a molecular level throughout the resultant polymer.

In one embodiment, the process sequence requires contact between the polymerization material and a metal oxide sol that includes a polycondensation product and a liquid (i.e. this contact must be *after* the metal oxide precursor and organophosphinate ions have been contacted and after hydrolyzing to form the metal sol). In a second listed embodiment, the polymerization material is also contacted with the metal sol (i.e. *after* the metal oxide precursor and organophosphinate ions have been contacted and after hydrolyzing to form the metal sol). In the third embodiment, the polymerization material, which is a pre-polymer, is contacted with the metal oxide sol (i.e. *after* the metal oxide precursor and organophosphinate ions have been contacted and after hydrolyzing to form the metal sol). None of the three process sequence embodiments combine the polymerization material with the phosphinate-chelated metal oxide precursor that is formed by reaction of the metal oxide precursor with a source of organophosphinate anions *before the hydrolyzing step*, as in the claimed subject matter. Claim 38, for example states the following process sequence:

contacting a metal oxide precursor with a source of organophosphinate anions to form a phosphinate-chelated metal oxide precursor;

contacting said phosphinate-chelated metal oxide precursor with a polymer material;
at least partially hydrolyzing said phosphinate-chelated metal oxide precursor to form at least partially hydrolyzed phosphinate-chelated metal oxide precursor monomers;
permitting said at least partially hydrolyzed, phosphinate-chelated metal oxide precursor monomers to polycondense to form a phosphorous-containing metal oxide sol, the sol comprising a dispersed phase of nano-clusters having an average size of less than about 1000 nm;

Thus, the sol is only formed *after* contact with the polymer material, unlike the Ryang methods that each requires hydrolyzing to form the sol prior to then contacting the sol with the polymerization material.

The Office Action also relies on the Abstract of Ryang. The Abstract states:

In one embodiment, the present invention relates to a polymer prepared from a mixture containing a polymerization material and a polycondensation product of a partially hydrolyzed chelated metal oxide precursor. In another embodiment, the present invention relates to a process for making a polymer involving contacting a polymerization material with a metal oxide sol comprising a liquid and a polycondensation product of a partially hydrolyzed chelated metal oxide precursor to form a mixture and at least one of polymerizing and curing the mixture of the polymerization material and the polycondensation product.

The Ryang Abstract is in accord with the Ryang Summary of the Invention with regard to the sequence of process steps and the point in the process in which the polymerization material is brought into contact with the other reactant. In the Abstract, the first embodiment specifies the polymerization material is contacted with a polycondensation product. This product is only obtained *after* the hydrolyzing step. Accordingly, the step of contacting the polymerization material with a polycondensation product is after the step of hydrolyzing. Similarly, the next listed embodiment requires contacting the polymerization material with the metal oxide sol, which is only formed *after* the hydrolyzing step. Applicant respectfully submits that the Abstract fails to disclose the sequence of steps as set forth in the claimed subject matter where the step of hydrolyzing is after the step of contacting polymer material with the phosphinate-chelated metal oxide precursor

3. Metal Oxide in Polymerization Material

The Office action at pages 9-10 deals with an issue that is not found in the claimed subject matter: namely, the incorporation of the metal oxide sol precursors into the polymer material prior to contact of the metal oxide precursors with the organophosphinate. The claimed subject matter, in Claim 38 for example, recites that the following sequence:

contacting a metal oxide precursor with a source of
organophosphinate anions to form a phosphinate-chelated metal
oxide precursor;
contacting said phosphinate-chelated metal oxide
precursor with a polymer material;

Claim 52 has a similar sequence. Thus there is, in sequence, first contact between metal oxide precursor and organophosphinate, and thereafter contact between the resultant reaction product and the polymer material. Accordingly, the incorporation of metal oxide precursors into the polymer material discussed at pages 9-10 of the Office Action is not an issue pertinent to the claimed subject matter.

4. The Combination of Ryang and Mehring is Inappropriate

To establish a prima facie case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation to modify a reference or to combine the teachings of multiple references. Second, there must be a reasonable expectation of success. Third, the prior art must teach or suggest all of the recited claim limitations. Of course, the teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, not in Applicant's disclosure. Applicant respectfully submits that the Office Action has not met all of the above criteria. In particular, it has failed to show any motivation for a person of ordinary skill in the art to combine the references asserted here. See, MPEP § 2143.

In MPEP § 2143.01, it is specifically stated that the mere fact that references can be combined, does not make the combination appropriate absent a suggestion or motivation in the references themselves to do so. "The mere fact that references can be combined or modified does not render the resultant combination obvious unless the prior art also suggests the

desirability of the combination. *In re Mills*, 916 F.2d 680, 16 USPQ2d 1430 (Fed. Cir. 1990) (. . . Although a prior art device "may be capable of being modified to run the way the apparatus is claimed, there must be a suggestion or motivation in the reference to do so." 916 F.2d at 682, 16 USPQ2d at 1432.). See also *In re Fritch*, 972 F.2d 1260, 23 USPQ2d 1780 (Fed. Cir. 1992) (flexible landscape edging device which is conformable to a ground surface of varying slope not suggested by combination of prior art references). (emphasis added)

The MPEP § 2143 also teaches that "A statement that modifications of the prior art to meet the claimed invention would have been "well within the ordinary skill of the art at the time the claimed invention was made" because the references relied upon teach that all aspects of the claimed invention were individually known in the art is not sufficient to establish a prima facie case of obviousness without some objective reason to combine the teachings of the references. *Ex parte Levengood*, 28 USPQ2d 1300 (Bd. Pat. App. & Inter. 1993). See also *In re Kotzab*, 217 F.3d 1365, 1371, 55 USPQ2d 1313, 1318 (Fed. Cir. 2000)(emphasis added and in original)"

Applicant respectfully submits that there is no teaching or suggestion to combine Mehring and Ryang. While Ryang deals with incorporation of sols into polymers, it does not teach or suggest flame retardation benefits of using specific sols. Mehring deals with sols but not with the issue of flame retardation of polymers. The Mehring article deals with chemical coupling agents and mentions well-known coupling agents such as the organo alkoxysilanes. Mehring indicates that he is "investigating the potentialities of organophosphorous compounds as coupling molecules." The aim appears to be to develop coupling agents to improve or develop new hybrid materials. Hybrid materials are defined as those that include an organic component (such as a polymer) coupled (via a coupling agent) to an inorganic component (such as silica particles). The article does not deal with the adding of partially hydrolyzed phosphinate –chelated metal oxide precursors to a polymer material to make a flame retardant polymer. It does not address flame retardation at all, but is solely concerned with coupling agents under development. In the instant patent application, the phosphorous is described as dispersed throughout the polymer making it flame retardant. The claimed subject matter is not primarily concerned with adding inorganic materials to polymers and with coupling agents,

although additives may be added to polymers, as set forth in the patent application, and an incidental benefit may be obtained. Rather, the primary significance of the phosphate-containing polycondensation product within the polymers is flame retardation.

5. Mehring does not supply the shortcoming of Ryang

As can be seen from the above discussion of the teachings of Mehring, it does not teach or suggest a sequence of steps in a process for making a flame retardant polymer composition. It does not supplement or complement the teachings of Ryang so that the combination might reasonably be read to suggest the step of first contacting the polymer material with the metal oxide precursor and organophosphinate and thereafter hydrolyzing and polycondensing to form the metal sol. Accordingly, the asserted combination fails to render the claimed subject matter obvious.

CONCLUSION

In conclusion, for the reasons given above, all pending claims are believed allowable and such allowance is respectfully requested. Should the Examiner have any questions or wish to further discuss this application, Applicant requests that the Examiner contact the undersigned attorney at (480) 385-5060 ext. 401.

If for some reason Applicant has not requested a sufficient extension and/or has not paid a sufficient fee for this response and/or for the extension necessary to prevent abandonment on this application, please consider this as a request for an extension for the required time period and/or authorization to charge Deposit Account No. 50-2091 for any fee which may be due.

Respectfully submitted,

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